Growth performance and cost benefits of broiler chickens fed diets containing donkeys' caecal meal as alternative feedstuff

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Abstract

*Inadequate feed ingredients, high cost of feeds and cost of poultry products have made researchers to look for alternative protein feedstuff. This experiment was therefore, carried out to assessed growth performance and economic benefits of broiler chickens as influenced by the diets containing donkeys' caecal meal (DCM). One hundred**- and fifty-day** old Anak breeds were used for the study. The birds were randomly assigned to five diets in a completely randomized design consisting of three replicates with 10 birds per replicate. Five experimental diets were formulated. Diets were substituted with donkeys' caecal content meal such that diet 1 (T_1) served as control (0%). Diet 2 T_2 contained 2.5% DCM and diets 3, 4 and 5 (T_3, T_4 and T_5) contained 5.0%, 7.5%, 10% (DCM) respectively. The experiment lasted for eight weeks. The data were subjected to analysis of variance (ANOVA) and Duncan New multiple Range Test. The results revealed that birds fed diet (T_2) had significantly ($P<0.05$) improved body weight gain (2396.00g), feed intake, superior feed conversion ratio than birds fed control diet (0% of the test diets (2340.33g). Diet (T_2) had highest ($P<0.05$) values in all the parameters, followed by diet T_3 in this experiment. The economic analysis revealed that as the percent of donkey caecal meal increased in diets containing 2.5%-7.5% DCM, the revenue was improved than others. The DCM could be substituted up to 10% without any adverse effect on the broiler chickens.*

Keywords: Inadequate, Feed, ingredients, Poultry, Donkeys' Caecal,

Performances de croissance et avantages financiers des poulets de chair nourris avec des régimes contenant de la farine caecale d'âne comme aliment alternatif

Résumé

Des ingrédients alimentaires inadéquats, le coût élevé des aliments pour animaux et le coût des produits avicoles ont poussé les chercheurs à rechercher des aliments protéinés alternatifs. Cette expérience a donc été réalisée pour évaluer les performances de croissance et les avantages économiques des poulets de chair influencés par les régimes contenant de la farine cæcale d'âne (FCÂ). Cent cinquante races Anak âgées de plusieurs jours ont été utilisées pour l'étude. Les oiseaux ont été assignés au hasard à cinq régimes dans un plan complètement randomisé composé de trois répétitions avec 10 oiseaux par répétition. Cinq régimes expérimentaux ont été formulés. Les régimes ont été remplacés par

des repas à base de caecaux d'ânes, de sorte que le régime 1 (T_1) ait servi de contrôle (0 %). Le régime 2 T2 contenait 2,5 % de FCÂ et les régimes 3, 4 et 5 (T_3, T_4 et T_5) en contenaient respectivement 5,0 %, 7,5 %, 10 % (FCÂ). L'expérience a duré huit semaines. Les données ont été soumises à une analyse de variance (ANOVA) et au test Duncan New Multiple Range. Les résultats ont révélé que les oiseaux nourris avec le régime (T_2) présentaient une amélioration significative (P < 0,05) du gain de poids corporel (2 396,00 g), de la consommation alimentaire et d'un taux de conversion alimentaire supérieur à celui des oiseaux nourris avec le régime témoin (0 % des régimes testés (2 340,33 g). Le régime (T_2) avait les valeurs les plus élevées (P <0,05) pour tous les paramètres, suivi du régime T_3 dans cette expérience. L'analyse économique a révélé qu'à mesure que le pourcentage de farine cæcale d'âne augmentait dans les régimes contenant 2,5 % à 7,5 % de FCÂ, le revenu ont été améliorés que d'autres. Le FCÂ pourrait être remplacé jusqu'à 10% sans aucun effet néfaste sur les poulets de chair.

Mots-clés : Inadéquat, Aliments, ingrédients, Volaille, Caecal d'âne

جعلت مكونات العلف غير الكافية والتكلفة العالية للأعلاف وتكلفة منتجات الدواجن الباحثين يبحثون عن مواد تغذية بديلة للبروتين لذلك، تم إجراء هذه التجربة لتقييم أداء النمو و الفوائد الاقتصادية لدجاج الفروج متأثرة بالوجبات الغذائية التي تحتوي على وجبة غزلية للحمير تم استخدام سلالات kanA التي يبلغ عمرها مائة وخمسين يومًا للدراسة. تم تخصيص الطيور بشكل عشوائي لخمسة أنظمة غذائية في تصميم عشوائي يتكون من ثلاثة نسخ مكررة مع عشرة طيور لكل نسخة مكررة. تم صياغة خمسة أنظمة غذائية تجريبية. تم استبدال الأنظمة الغذائية بوجبة محتوى الحمير. فنظام غذائ الأول (1T) قام بمثابة الراقب (0%). والثاني (2T) احتوت على 2.5% وجبة من الحمير، والثالث والرابع والخامس(3T, 4T، 5T) احتوت النسب المئوية المذكورة على التوالي واستمرت التجربة لمدة ثمانية أسابيع.خضعت البيانات لتحليل التباين (AVONA) و اختبار نطاق متعدد جديد المسمى بـnacnuD, كشفت النتائج أن الطيور التي تغذت على النظام الغذائي الثاني قد حسنت بشكل كبير (P < 50.0) زيادة وزن الجسم (2396.00 جرام), تناول الأعلاف، نسبة تحويل الأعلاف المتفوقة من النظام الغذائي الذي تتغذى عليه الطيور (0٪ من الأنظمة الغذائية الاختبارية (2340.33 جرام), كان للنظام الغذائي الثاني أعلى قيم (P < 50.0) في جميع المعلمات، يليه النظام الغذائي الثالث في هذه التجربة. كشف التحليل الاقتصادي أنه مع زيادة نسبة وجبات الحمير في الأنظمة الغذائية التي تحتوي على 2.5٪ -7.5٪ وتحسنت الإيرادات عن غيره يمكن استبدال الوجبة الغزلية للحمير بنسبة تصل إلى 10٪ دون أي تأثير سلبي على دجاج الفروج.

Introduction

Poultry is more accessible when compared to other livestock. It uses smaller land mass, water, and feed for each kilogram of meat farmers produce. Feeding is an essential in animal production as it takes a major share of the total costs of intensive animal production schemes by **Akanbi** *et al*. (2020). Its availability and accessibility and food value chain has affected all the processes that relate to farm production to final consumer. Poultry need dietary supplement daily to improve their growth, so it is necessary to balanced diets for animals generally, to enhance their product performance as well as their immunity. Poultry production is more sustainable especially broiler chickens that has short generation period. It has lower environmental impact than ruminant animals' like cattle, sheep, and goat. They use smaller amount of feed per kilogram of meat produced and smaller land and water for both farming and feed production (Flachowsky *et al*., 2017). The rapid growth rates and superior feed conversion ratios of broiler chicken has made its production one of the most economic and as well easiest ways of bridging the supply demand gap of animal proteins. It is beneficial and sustainable, but its set back is limited feed resources, high prices of feed ingredients,

farm input mainly the high cost of feeds. Any farmer aims to produce a healthy animal and its products at the least cost and be able to supply it to customers. The shortage of accessing farming inputs, for instance, feed resources has resulted to high cost of feeds and cost of poultry products like (eggs and meat). These has made researchers to focus on exploiting cheaper and locally available and accessible alternative agro-by products and abattoir wastes especially those without nutritional value to human. This situation has significantly endangered the sustainability of broiler production and global food security, particularly animal protein resources. Since sustainability in feed production is a key challenge for animal production (Aiking, 2014), it is necessary to make best use of the economic with environmental elimination of abattoir waste and as well stimulating improved attention in the research of slaughterhouse by-product for potential utilization as protein feed materials in livestock rations (Mohammed *et al.,* 2005). Addition of this feedstuff in broilers feeds will drastically reduce the problems of the scarcity of feed supply in developing countries. One of the alternative animal by-products that can be used as feedstuff is Donkeys' Caecal Content (DCC). It contains digested feed materials at different stages of degradation, saliva (making up the rumen liquor), microorganisms with the products of their metabolic activities for example, protein, amino-acid, vitamin, peptides (Makinde *et al.,* 2017) and contains minerals, energy and others. Incorporation of such products in feed would help in alleviating the problem of the scarcity of feed supply that is having a negative effect on livestock industry. Hence this study will focus on assessing growth Performance, economic analysis of Broiler Chicken Fed Graded Levels of Diets Containing Donkeys' Caecal Meal (DCM).

Materials and method

Source and processing of the donkeys' caecal content

Donkeys' Caecal content was collected from the main abattoir in Ohaukwu at Nkwo-Ezzangbo main market. The intestine was split open with the aid of sharp knife and the content was emptied into a 25 litres plastic bucket. The caecal content was boiled separately for 30 minutes. The donkey caecal contents (DCC) were sun-dried on concrete floor for four days to about 12% moisture. The sun drying was done within the month of April and May. The dried caecal content was milled in a hammer mill and stored for further use.

Table 1: Proximate and Gross Energy Composition of Donkey Caecal Meal (DCM)

Parameters (%)	Donkey Caecal Meal
Moisture (M)	11.23
Crude Protein (CP)	20.67
Crude Fibre (CF)	5.04
Ether Extract (EE)	1.81
Total ash	4.66

Experimental diet

The processed DCM was used to formulate five experimental diets such that diet I (T_1) contained 0% DCM without supplementation (control). Diet 2 (T_2) contained 2.5% DCM without supplementation. Diets T_3, T_4 and T_5 contained 5.0%, 7.5% and 10% DCM, respectively.

Experimental animals and management of the broiler chickens.

One hundred- and twenty-day old chicks were used for the study. Each bird was weighed before the commencement of the experiment and weekly throughout the experiment period. The birds were randomly allotted to five dietary treatments in a completely randomized design (CRD). Other poultry management practices were maintained, and the experiment lasted for five weeks (56days).

Statistical analysis

All data obtained were statistically analyzed and subjected to analysis of variance (ANOVA) as outlined by Sedecor and Cochran (1978). Duncan new multiple Range Test as outlined by Obi (1990) was to separate the means.

Collection of blood samples and analysis

Blood (2ml) was collected from three birds of each replicate via wing vein. Samples collected were put in a sterile bottle tube containing Ethylene Diaminetetra-acetic acid (EDTA) as anticoagulant to prevent blood clothing before the analysis. Packed cell volume (PCV) and haemoglobin count were determined as described by Ewuola and Egbunike (2008). Analysis to be obtained serum albumin and protein were analyzed using sigma kits according to Feteris (1965) total cholesterol was determined spectrophotometrically.

Results and discussions

The results of the proximate composition of feed ingredients are shown in Table 3. The result revealed that the crude protein content ranges from 21.09 - 21.37. The values obtained in all the parameters determined indicates that unsupplemented and supplemented DCM compared favourably with the control diet (0% DCM).

Table 2: Gross Composition of Experimental Diets Containing Donkeys' Caecal Meal.

Treatments:	1	2	3	4	5
Ingredients (%)	0	2.5	5.0	7.5	10
Maize	50.00	50.00	50.00	50.00	50.00
Soyabean meal	25.00	22.50	20.00	17.50	15.00
DCM	0.00	2.50	5.00	7.50	10.00
PKC	9.00	9.00	9.00	9.00	9.00
Wheat Offal	10.00	10.00	10.00	10.00	10.00
Fish Meal	3.00	3.00	3.00	3.00	3.00
Bone Meal	2.00	2.00	2.00	2.00	2.00
Premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Calculated Chemical Composition					
Crude Protein	20.60	21.29	21.16	21.14	21.11
Crude Fibre	4.28	6.28	6.43	6.48	6.52

Vit.K;2.5g, Vit, B2;0.3g, Vit.B6; 8.0mg, Vit.B12;8.0g, Nicotinic acid; 3.0, Ca-Panthothenate;5.0mg, Fe;10.0g, Al;0.2g, u;3.5mg, Zn;0.15mg, I;0.02g, Cu;0.01g, Sc. DCM = donkeys' caecal meal
PKC =

Palm kernel cake. Total ME/Cal (kg) = Total Metabolizable Energy per Calorie in KilogrammePremix supplied (Univit 15 Roche) contained: 15001.U, Vit.A; 15001.U, Vit.D; 30001.U, Vit.E;3.0g.

Table 3: Proximate and Gross Energy Compositions of Experimental Diets

Treatments:	1	2	3	4	5
Parameters (%)	0	2.5	5.0	7.5	10
Dry Matter	90.29	90.22	90.60	90.13	90.11
Crude Protein (CP)	20.09	21.08	21.17	21.28	21.37
Ether Extract (EE)	3.65	3.69	3.72	3.77	3.83
Crude Fibre (CF)	6.04	6.12	6.33	6.41	6.48
Ash	5.94	6.02	6.07	6.09	6.12

[a,b,c,d,e] Means in a row with different superscripts are significantly different (P<0.05).
SEM = Standard Error of mean.

As shown in Table 4, there were significant (P<0.05) differences in all the parameters measured except for initial body weight. For final weight/bird for diets T_2, T_3 and T_4 were significantly (P<0.05) higher than diets T_5 and the least was recorded in diet T_1. The higher weight gain of birds obtained in diets T_2, T_3 and T_4 could be attributed to proper utilization of protein, energy, vitamin and mineral components of their diets. The observed highest value in feed intakes of birds was recorded for T_5 was because birds ate more feed to attain their energy requirement. Birds fed diets T_2, T_3 and T_4 were significantly (P<0.05) influenced than those birds fed control diet T_1.

Table 4: Performance of Broiler Chickens fed Graded Levels of Donkey' Caecal Meal

Treatments:	1	2	3	4	5	
Parameter	0	2.5	5.0	7.5	10	SEM
Initial weights/bird (g)	100.33	102.67	101.67	101.33	101.33	0.30
Final weights/bird (g)	2340.33c	2396.00a	2388.33a	2384.67a	2351.33b	8.03
Weights gain/bird (g)	2231.33c	2293.33a	2286.67a	2283.33a	2250.00b	8.25
Feed intake /bird (g)	4786.67c	4800.00c	4806.67c	4850.00b	4891.33a	11.20
Feed conversion ratio	2.14a	2.08d	2.10c	2.12b	2.16a	0.009

a,b,c Means in a row with different superscripts are significantly different (P<0.05).
SEM = Standard Error of mean.

The improved weight gain of birds fed diets containing 2.5% - 5.0% DCM probably may be due to proper utilization of nutrient. Birds fed diet with 2.5% DCM recorded the best feed conversion ratio followed by diet with 5.0% DCM. There were significant (P<0.05) differences in all the parameters considered. The result revealed that cost/kg feed (N), cost of feed consume/bird in (N), the cost of kg/weight gain and cost of production/bird were (P<0.05) higher in control diet than the substituted diets 2.5% - 10% DCM. The values reduced as the percent substitution of DCM increased in the diets containing 2.5% -10% DCM. As the percent of donkey caecal meal increased in diets containing 2.5%-7.5% DCM in the revenue were improved.

Table 5: Economic analysis of Broiler Chickens fed Graded Levels of Donkeys' Caecal Meal

Treatments:	1	2	3	4	5	
Parameter (₦)	0	2.5	5.0	7.5	10	SEM
Cost/kg feed	160.98	147.16	145.38	142.60	139.81	2.03
Cost of feed consumed/ bird	659.64[a]	605.24[b]	599.55[b]	598.59[b]	594.95[c]	6.58
Cost/kg weight gain/bird	305.93[a]	287.51[b]	286.95[b]	281.02[c]	273.66[d]	4.20
Cost of production/bird	659.64[a]	605.28[b]	599.55[b]	598.59[b]	594.95[c]	6.58
Revenue (@ ₦750/kg)/bird	1674.17[c]	1720.00[a]	1715.00[a]	1712.50[a]	1687.50[b]	6.14
Gross margin/ bird	1014.46[c]	1114.62[a]	1115.45[a]	1113.91[a]	1092.55[b]	11.10

SEM = Standard Error of mean. Kg = kilogramme

The gross margin was ($P<0.05$) higher in groups fed 2.5%-5.0%. Diet T_2 and T_4 (2.5% - 7.5%) becomes more economically viable than others since the higher the gross margin the superior the diet (Ogbonna, 2000).

Conclusion

Supplementation of DCM diets improved body weight gain, feed intake, feed conversion ratio and reduced cost of broiler rearing. Diet (T_2) had highest ($P<0.05$) values in all the parameters. The DCM can be included in broilers diets up to 10% without any adverse effects on growth performance and health of broilers. Since it could be obtained at little or no cost, it could be increased to 20%.

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